



NANO TECHNOLOGY: BENEFITS AND RISKS

Patel Hirenkumar Mohanlal

M.Sc., B.Ed., GSET (Double Gold Medalist)

ABSTRACT

Nano technology is micro in size but large in usages. Nano technology is scaled in nano meter but its effective field is very large. As due to revolution in information technology and communication field, world has changed thoroughly, same as, nano technology is also considered as an 'Age-changer' technology. It will affect on science, business, engineering, medical, electronics, defense and day to day technology. It is believed that Nano technology is in its infant stage right now, but up to 2025 it will be developed fully. Specially, Nano technology is of atomic scale, so, Newton's motion law of physical object can't be applicable to it. But it follows the rules of Quantum mechanics. Because of this reason scientists are excited, and they believe that through Nano technology, it has been possible to work at atomic scale and so it is useful in many ways. With the help of Nano technology, we can work at atomic scale. This is the main plus point of Nano technology.

But we evaluate this point on the basis of its limitations, we will be shocked. An unexpected deficiency when we work on DNA is only due to Nano technology or terrorist spy about country's defense system with the help of Nano technology. It is really shocking. Seeing the glittering uses of Nano technology, we should not neglect its risk factors. Today we haven't proper guideline how to use Nano technology. At this time our blind run behind Nano technology may be so dangerous for environment and humanity that we will not be able to repay for this till centuries.

KEYWORDS: Nanomaterials (NM), Nanotechnology, Nanoparticles (NP).

INTRODUCTION:

In the year 1492, Christopher Columbus started his journey from Spain in ship, and discovered a new continent - America. This news, the queen of Spain Isabella, got after five months^[1]. In versus, today we can get any news of any country within a moment with the help of computer and internet. Scientific development in the field of information technology and communication has changed the world map. Today, once again another technology is taking shape in the world, which has a capacity of changing the world and that is - Nano technology.

"There is plenty of room at the bottom."

– Prof. Richard P. Feynman

In a year 1959, the winner of Noble Prize in physics, Prof. Richard P. Feynman said this sentence and pointed out toward Nano technology^[2].

Nano technology is considered to be the latest technology of today, but the same thing had been said in history also. For example, Greeks and Romans used to glitter pots. Nano particle of different size and shape of silver and gold were used to make different color of glass. The reason of not touching rust to Tipu Sultan's sword is only Nano particles of carbon on it^[3].

Classical Newton's motion laws are not applicable to Nano material. Forces between Nano particles follow the rules of quantum mechanics. The reason of extra-ordinary properties of Nano particles is its surface area and volume's ratio. Sticking and friction plays an important role in Nano materials because of the higher ness of SA/V ratio. So that having same chemical structure, nano particles has different size, shape and electric charge and so it has different properties too.^[3]

Nano materials used in nano technology are divided into five sections:

1. The first class of Nano materials, carbon nanotubes (CNTs) and related materials, originated with the discovery in 1985 of the first fullerene, a 60-carbon atom hollow sphere, also known as the buck ball^[4] and because of these modifications these materials find their use in certain applications as well as concerns regarding their fate and behavior in the environment.
2. The second class of nano material is metal-containing materials, including metal oxides. The synthesis of metal and metal oxide nano particles is very common and within the capability of most chemical laboratories.^[5]
3. The third class of Nano materials includes quantum dots.
4. Fourth class of nonmaterial includes Zerovalent metals. They are typically made by reduction of solutions of metal salts. Their physical properties can be controlled by varying the reductant type and the reduction conditions. For zerovalent iron, the easiest and most popular method of preparation is

through the reduction of ferric (Fe [III]) or ferrous (Fe [II]) salts with sodium borohydride.^[6]

5. Dendrimers comprise the fifth class of Nano materials.

BENEFITS OF NANO TECHNOLOGY:

Nano technology's devices are micro but its usages are macro. Nano technology touches whole areas of science and day to day life because of its unique properties. Nano technology's today and future benefits are as below:

- Nano technology works atomic scale. So it will work for human cell and DNA. Deficiency in DNA and its incurable diseases can be controlled through this technology. In the disease like cancer, the defective cell can be removed and can crack cancer.^[7]
- With the help of Nano technology, curing can be easy, cheap, accurate and quick. In addition, medicine made from nano materials, effects only on the affected area, its side effects can be decreased.^[8]
- Nano materials are super conductor to electricity and heat, so in the field of electronics and industry more efficient tools can be produced.
- Quantum dots (QDs) are semiconductor nano crystals, have a reactive core which controls its optical properties, and these cores can be made out of metals or semiconductors such as cadmium selenide (CdSe), cadmium telluride (CdTe), cadmium selenium telluride (CdSeTe), indium phosphide (InP), or zinc selenide (ZnSe). The reactive semiconductor cores are surrounded by a shell, such as silica, or a ZnS monolayer that protects the core from oxidation and enhances the photoluminescence yield.^[9,10] The cores are produced from a nucleation reaction of the metal/semiconductor material, such as in a high-temperature solution phase synthesis, and subsequent growth of these crystals, with reaction conditions controlling the size.^[11] Although to date, used largely in medical applications such as medical imaging and targeted therapeutics, the use of QDs is being extended to include solar cells and photovoltaic, security inks, and photonics and telecommunications.^[12]
- Out of nano materials we can make different devices which are solid than steel but lighter than plastic in weight which will work effectively with less energy.
- More efficient instruments can be made by nano technology in defense. Such as fireproof clothes and tiny instruments for spy. Biological and chemical sensors take shape to avoid biological and chemical attack of enemy.
- Nano particulate zero-valent iron has been used for some time for the remediation of waters, sediments, and soils to remove nitrates via reduction and has most recently for detoxifying organ chlorine pesticides

and polychlorinated biphenyls. In addition, we can get pure air, water and food.^[13]

- Very sensitive changes can be noted in atmosphere. Through that we can predict accurately. In a same way, due to change in stress of earth's layer, we can predict about earthquake.
- Of all nano materials, nano particulate silver has the greatest number of consumer product applications. These products range from wound dressings, socks, and other textiles, air filters, toothpaste, baby products, vacuum cleaners, and washing machines. These are metallic silver NPs or electrochemically generated ionic silver. Ionic silver is highly reactive, is readily adsorbed by both macro particles and colloidal particles such as iron oxyhydroxides or natural organic matter in natural waters, and ranges in size from <1 kDa to >0.45 μm .^[14] Silver's antimicrobial activity is most often attributed to the dissolved cation rather than the high-surface-area, low-solubility nonionic metallic NP. Colloidal elemental gold has also been used for many years, especially in medical applications as vectors in tumor therapy.
- Eco-friendly energy source will be produced through which damage in environment can be stopped.

The list of established benefits include improved manufacturing methods, energy systems, better food production methods and nutrition and large scale infrastructure auto-fabrication. Carbon nanotubes and their derivatives are used in plastics, catalysts, battery and fuel cell electrodes, super capacitors, water purification systems, orthopedic implants, conductive coatings, adhesives and composites, sensors, and components in the electronics, aircraft, aerospace and automotive industries. NM can have the potential to improve a variety of packaging-performance attributes such as oxygen and moisture blockage, ink or dye-free coloration and increased strength.

RISKS OF NANO TECHNOLOGY:

There are many benefits of Nano technology, but imagination of unexpected mistake in calculation during its use or negative use by terrorist is really shocking. Thus there are some hidden risks which we can't ignore. Some risks in using nano technology are given below:

- Possibilities of mistakes become more due to work done at atomic scale. An unexpected mistake can cause a permanent deficiency in DNA. Same mistake can produce a new dangerous virus.
- Nano technology's devices are micro so spy can be easily done, people privacy is in danger.
- Flying insect in confidential meeting of country's security system may be terrorist spy robot with camera. In the same way flying butterfly near celebrity may a killer bomb.
- Infinite human and animals may die during war due to uses of more efficient and more dangers instruments in defense.
- The effect of NMs have been studied in live model e.g., the lethal doses over six months for lab rats, of different kinds of nano particles are often characterized by a Skov Kjaer index, named after the scientist Kasper Skov Kjaer.^[15] Some nano materials have proved toxic to human tissue and cell cultures in vitro (test tube) studies, resulting in increased oxidative stress, production of proteins triggering an inflammatory response,^[16] DNA mutation,^[17] structural damage to cell nuclei and interference with cell activity and growth,^[18] structural damage to mitochondria and even cell death.^[19]
- Unemployment increases in routine life due to good, cheap, accurate, easy and quick work.
- Zheng et al. examined the effects of nano- and bulk TiO_2 on spinach seed germination and early plant growth in simple Perlite media containing a complete nutrient solution. Nano- TiO_2 significantly increased seed germination and plant growth at low concentrations but decreased these parameters at high concentrations. Bulk TiO_2 had little effect. The Manufactured Nanoparticles in Zheng et al.^[20] were not physically characterized, and no details of size or surface reactivity of the materials were provided.
- Use of nano iron in the United States is widespread. However, there is effectively a (voluntary) moratorium on zero-valent iron being used in the United Kingdom for remediation purposes because of unknown potential effects of release of free NPs into the environment.^[21]
- Environment damages due to nano particles which spread in atmosphere unknowingly or carelessly. During production of nano materials like carbon nano tube in nano technology.
- Nano particles are very reactive so they attached with other compounds in

a moment. Due to this extraordinary character, there arise problems about health and environment.^[22]

CONCLUSION:

Nano technology is a modern technology which affects many field of our life. Nano technology affects on agriculture, industry, engineering, defense, medical, energy, economy, environment and many others living life fields. Nano technology is considered as a 'generation changer technology' after information technology in the world of science. Scientist believes that we can get answer of many unsolved questions with help of nano technology. But between greed of all these benefits we can't ignore its hidden risks. At present, we have no proper guideline to use nano technology. At this time uncontrolled or negative use of nano technology may be dangerous for human. Especially in developing country, these risks are ignored by political leader and it becomes cause of environment and health damages. Until we can understand totally behavior of nano materials, we should not use it. Otherwise it will be risk. It is not advisable to use it. So, we must commercial use any new nano material only after tested for safety and hygiene.

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